

Chapter 13Problem 39

a) What is the orbital radius for an earth satellite with a period of 1 hr?

$$T = 1 \text{ hr} = 3600 \text{ s}$$

$$M_e = 5.97 \times 10^{24} \text{ kg}$$

(Data from Appendix D)

$$T^2 = \frac{4\pi^2 r^3}{GM} \rightarrow \frac{GM T^2}{4\pi^2} = r^3$$

$$r = \sqrt[3]{\frac{GM T^2}{4\pi^2}}$$

$$= \sqrt[3]{\frac{(6.67 \times 10^{-11} \text{ N m}^2/\text{kg}^2)(5.97 \times 10^{24} \text{ kg})(3600 \text{ s})^2}{4\pi^2}}$$

$$= \sqrt[3]{1.307 \times 10^{20} \text{ m}^3}$$

$$= 5075 \text{ m}$$

b) What is unreasonable about this result?

It's below the surface of the earth, which is 6,378 m.